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Fisheries Development Division
Fisheries and Habitat Management Branch

Newfoundland
Region

Deepwater Turbot Survey
Northeast Coast of Newfoundland
July - August, 1990

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Canada

DEEPWATER TURBOT SURVEY

NORTHEAST COAST OF NEWFOUNDLAND

JULY - AUGUST, 1990

L. Yetman
D. Staubitzer

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ABSTRACT

Yetman, L., D. Staubitzer, 1990. Deepwater Turbot Survey Northeast Coast of Newfoundland, 1990.

In the summer of 1990, two commercial fishing vessels were each chartered for 16 days and directed to fish for turbot in deepwater off the Northeast coast of Newfoundland, using gillnets. Observers aboard the vessels were required to keep accurate records of all fishing locations, catch rates, and water depths. The information collected was used to assess the potential of such fishing operations in the area.

The exploratory survey covered an area of 2,100 square nautical miles between 105 and 180 nautical miles east of the Funk Islands. Water depths in this area range from 360 to 1,500 metres, with 85% of the survey taking place in water depths that exceeded 800 metres. In order to determine the catch rate effectiveness of varying gillnet mesh sizes, each fleet was comprised of 8.0", 7.5", and 6.5" mesh nets, alternately placed throughout the fleet. The vessels did not experience any significant problems with retrieving the gillnets, and demonstrated that vessels of the 65' class can effectively fish with gillnets in deep water.

A total of 60,706 kgs of turbot were landed by the two fishing vessels, with significant catches being experienced throughout the entire survey area. There were also notable by-catches of roughhead grenadier, black dogfish, as well as a number of other species.

The results of this survey indicate that regardless of water depth (700 to 1,300 metres), the use of larger gillnet mesh sizes (7.5" and 8.0") increases the overall yield of turbot per net by increasing the size of the fish captured. The larger mesh gillnets also had a lower occurrence of undesirable by-catches.

INTRODUCTION

There has been growing interest recently by the fishing industry and governments in the commercial potential of Greenland Halibut (Reinhardtius hippoglossoidies), commonly known as turbot, in the deep waters off the Northeast coast of Newfoundland and along the Labrador coast. Historically, the total allowable catch (TAC) for this species has never been realized. This is due in part to the fact that much of the fishing effort to date has been conducted in waters not exceeding 650 metres (355 fathoms). In the mid sixties and early seventies, fishermen had extremely good catches of turbot along much of the Northeast coast and especially in the area of the Funk Island Bank. Recently, however, catches in these areas have fallen drastically. Catch information from foreign fishing efforts directed at turbot and roundnose grenadier (Coryphaenoides rupestris) in deeper offshore waters indicate a presence of large turbot. Although catch rates in both the turbot and grenadier fisheries are somewhat low, it was felt that gillnetting may provide a means to capitalize on the deepwater stocks.

From July 27 to August 11, the Fisheries Development Division, Fisheries and Habitat Management Branch, Department of Fisheries and Oceans commercially survey for turbot off the Northeast coast of Newfoundland (NAFO 3K Area) using gillnets in water depths ranging from 700 to 1300 metres (383 to 710 fathoms). In order to compare the average catch rates of different gillnet mesh sizes, mesh sizes ranging from 5.5" to 8.0" were used during the survey.

Two 65' vessels, the FV "Shanaleen" and the FV "Ashely and Brothers" were each chartered for 16 days. This report provides descriptions of the vessels, fishing gear, method of operation, fishing effort and catch results. In addition, project conclusions and recommendations are also provided.

DESCRIPTIONS OF CHARTERED VESSELS

F.V. Shanaleen -	L.O.A.:	64'11"
	L.O.B.:	22' 0"
	Engine:	3412 Caterpiller Diesel (652 Hp)
	Navigation:	Two Loran C Receivers
		One Loran C Plotter
		Two Radars (48 mile and 24 mile)
	Sounders:	Two Depth Sounders
	Communications:	Two VHF Radios
		One SSB Radio

F.V. Ashley and Brothers -	L.O.A.:	64'11"
	L.O.B.:	22' 0"
	Engine:	Cummins Diesel
	Navigation:	Two Loran C Receviers
		One Loran C Plotter
		Two Radars (24 mile)
	Sounders:	Two Depth Sounders
	Communications:	Two VHF Radios
		One SSB Radio

DETAILS OF SURVEY AREA

The exploratory survey covered an area of 2,100 square nautical miles in deep waters between 105 and 180 nautical miles east of the Funk Islands. This area lies between 49 40' and 51 00' North Latitude, and between 49 29' and 50 32' West Longitude. The survey area was divided into 21 blocks, each measuring ten nautical miles by ten nautical miles (See Figure One). One of these blocks (H4) was used as an initial test site, and therefore had a lower fishing effort and catch rate. Water depths in the area range from 360 to 1,500 metres (195 to 820 fathoms).

DETAILS OF FISHING OPERATIONS

Each gillnet fleet was comprised of 8.0", 7.5", 6.5" mesh nets, alternately placed throughout the fleet. A limited number of 6.0" and 5.5" mesh nets were also set by the FV "Ashley and Brothers". The Fisheries Development Division provided 75 nets to each vessel which in turn carried an additional 75 nets being provided by the vessel owners.

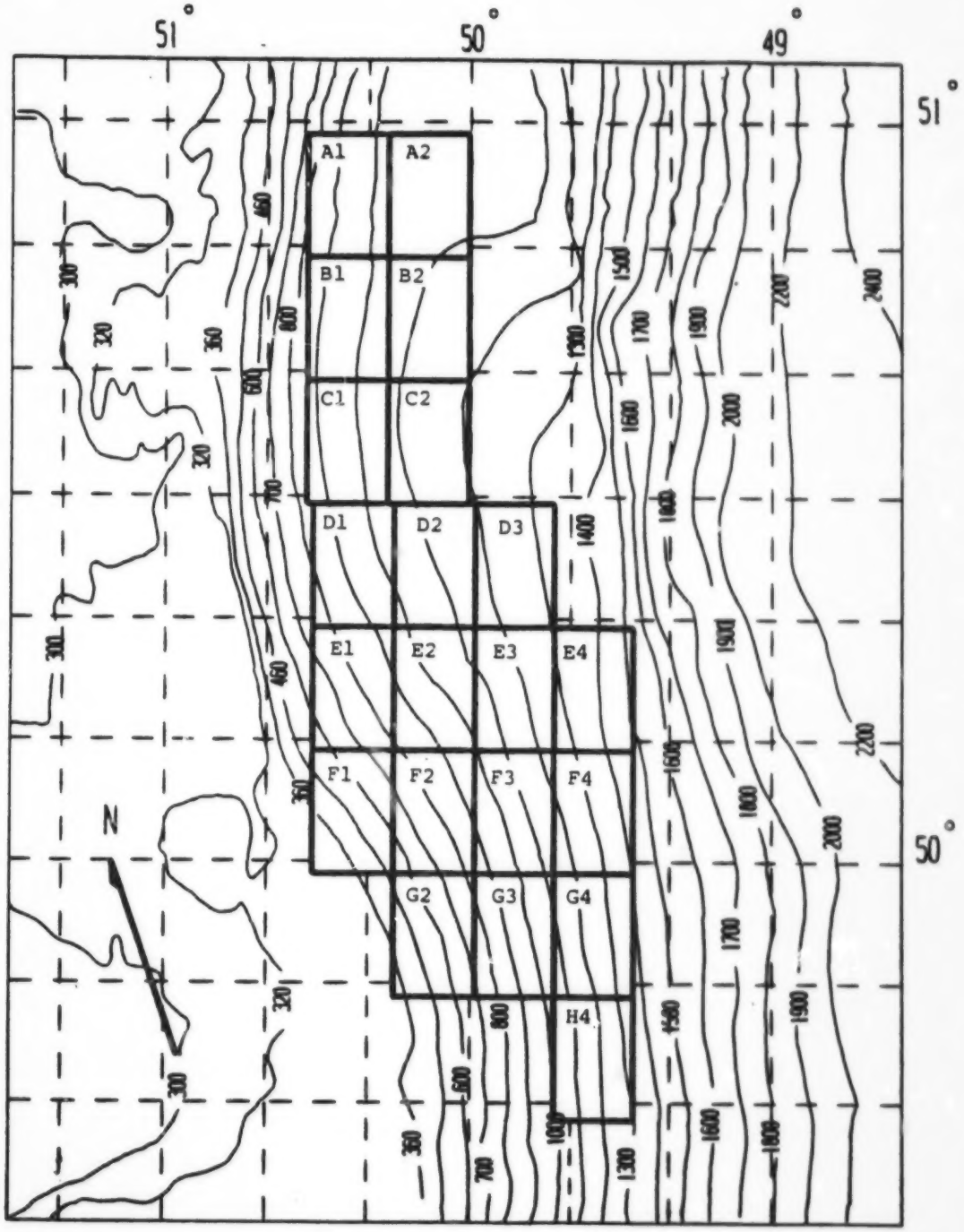

Figure 1. Area of Fishing Operations

The specifications of the 8.0" and 7.5" mesh nets, supplied to the vessels by the Department of Fisheries and Oceans, are provided in Figure Two. Each gillnet fleet was weighted, and marked with a 190 cm (75 inch) staff bouy with radar reflector and a 190 cm (75 inch) tail buoy attached to 5/8 inch haul-up ropes.

A minimum of two gillnet fleets were set and hauled in each fishing block. In some blocks, up to six fleets were fished at varying depths. A minimum distance of three nautical miles was maintained between each set, with a minimum soak time of 24 hours alloted for each fleet. Most fleets, however, were fishing for over 40 hours, with an average soak time of 54 hours. Hauling times ranged from 2.5 hours to 5.0 hours depending on the depth of the fleet and the size of the catch. The average hauling time per fleet was 3.75 hours. Eighty-Five percent of the survey was conducted in water depths exceeding 800 metres (437 fathoms), with an average fleet depth of 1070 metres (585 fathoms). Retrieval of the nets from deep water presented no problems other than the fact that several nets on the end of each fleet where hauling was initiated became twisted. A summary of the daily activity of both vessels is provided in Appendix One, while Appendix Two provides a complete account of fishing effort and catch results.

DISCUSSION OF RESULTS

During the survey, a total of 60,706 kgs (133,555 lbs) of turbot was landed by the two fishing vessels. The "Ashley and Brothers" landed 26,427 kgs (58,141 lbs) while the "Shanaleen" landed a catch of 34,279 kgs (75,414 lbs). In addition to this, there were also significant by-catches of roughhead grenadier, black dogfish as well as a number of other species. Table 1 provides a catch summary for the survey.

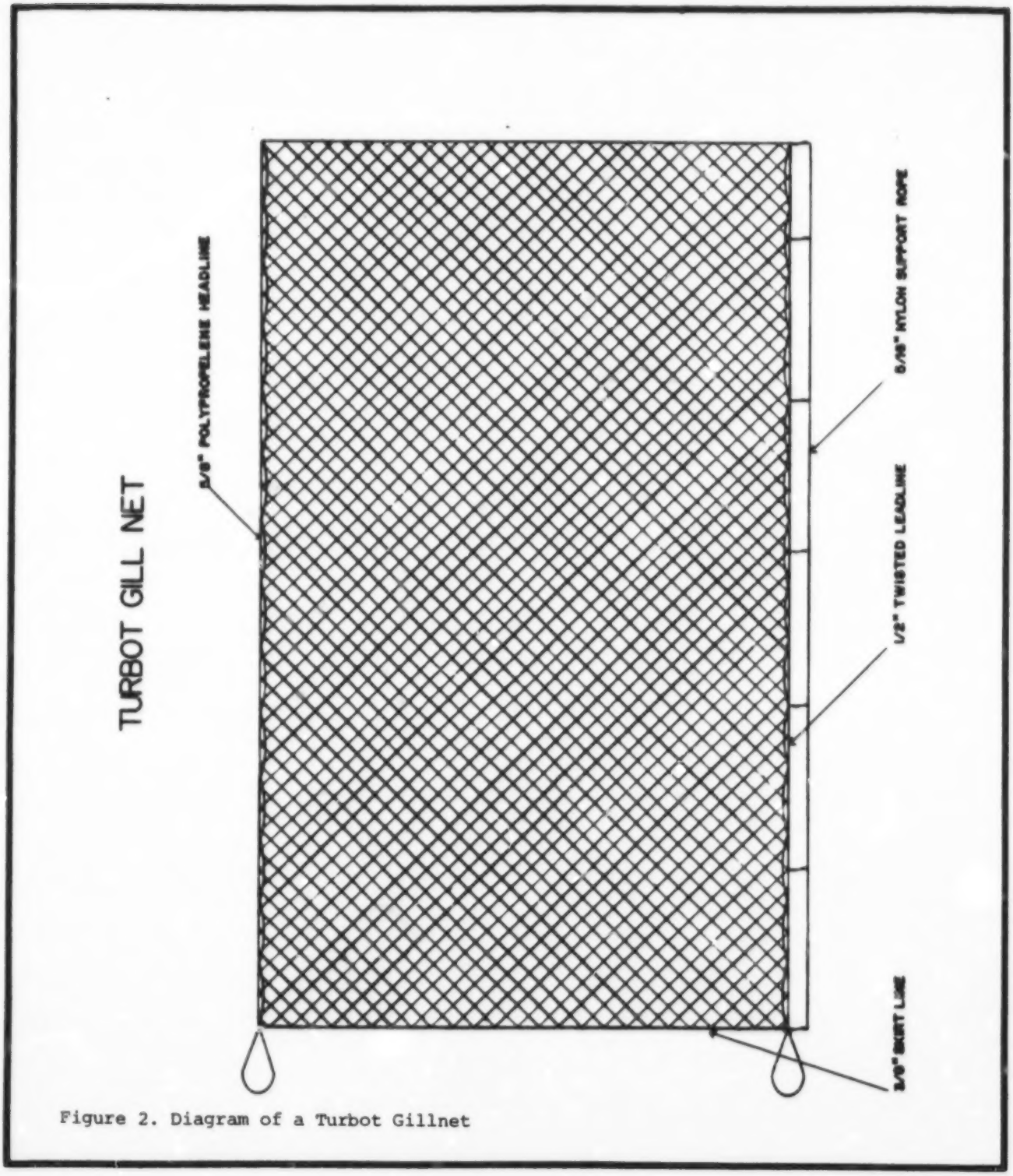

Figure 2. Diagram of a Turbot Gillnet

Table 1. Catch Summary - July 27 to August 11, 1990.

Species	Quantity	Comments
Turbot (Reinhardtius hippoglossoides)	60,706 kgs (133,555 lbs)	Sufficient quantity for commercial fishing
Roughhead Grenadier (Macrourus berglax)	12,162 kgs (26,756 lbs)	Low market price at present
Black Dogfish (Centroscyllium fabricii)	3,363 kgs (7,398 lbs)	No commercial value at present
Chimaera (Hydrolagus affinis)	1,300 kgs (2,860 lbs)	No commercial value at present
Blue Hake (Antimora rostrata)	700 kgs (1,540 lbs)	Insufficient quantity to be commercial
Other	156 kgs (343 lbs)	See below
Total catch of all species	78,387 kgs (172,452 lbs)	

Note: Other species caught in small quantities included Northern wolffish, Spotted Wolffish, Tapirfishes, Roundnose Grenadier, Longnose Grenadier, Redfish, Silver Rockling and Daggertooth.

The species outlined in Table One are typical of the bycatches caught by Soviet and East German otter trawlers in deep waters off the northeast coast of Newfoundland while fishing for roundnose grenadier. Roundnose grenadier is typically smaller than the roughhead species and therefore probably escaped the large mesh nets employed in this survey.

While each survey block yielded a significant catch of turbot, the highest total turbot catch was recorded in Block E1. The six fleets set in this area landed a total catch of 15,700 kgs (34,540 lbs), for a yield per net of 125.6 kgs (276 lbs). The average yield of turbot per net of all blocks surveyed (excluding Test Block H4) was 44.0 kgs (97 lbs). Overall catch rates of roughhead grenadier and black dogfish averaged 8.8 kgs (19.3 lbs) and 2.4 kgs (5.2 lbs) per net respectively. An examination of the mesh / yield comparison displayed in Table 2, indicates that the larger mesh sizes provide a significantly higher

yield of turbot per net, while reducing the occurance of essentially undesirable bycatches of roughhead grenadier and black dogfish.

Table 2. Mesh / Yield Comparison

Mesh Size	# of Nets Hauled	Turbot kgs (lbs)	Turbot kgs/net (lbs/net)	RHG kgs (lbs)	RHG kgs/net (lbs/net)	Black Dogfish kgs (lbs)	Black Dogfish kgs/net (lbs/net)
5.5"	73	2,224 (4,893)	30.5 (67)	937 (2,062)	12.8 (28)	148 (326)	2.0 (4)
6.0"	143	4,190 (9,219)	29.3 (64)	1,112 (2,447)	7.8 (17)	409 (900)	2.9 (6)
6.5"	417	18,972 (41,738)	45.5 (100)	5,089 (11,196)	12.2 (27)	1,852 (4,074)	4.4 (10)
7.5"	332	18,880 (41,538)	56.9 (125)	3,051 (6,711)	9.2 (20)	658 (1,446)	2.0 (4)
8.0"	325	16,440 (36,167)	50.6 (111)	1,973 (4,341)	6.1 (13)	296 (652)	0.9 (2)
Total	1,290	60,706 (133,555)		12,162 (26,756)		3,363 (7,398)	

An analysis of sample catches recorded on the "Ashley and Brothers", also indicates that the average length and weight of turbot caught in the 7.5 and 8.0 inch mesh are higher than the other mesh sizes. This information is presented in Table 3.

Table 3. Sample Turbot Catches - FV "Ashley and Brothers"

Sample No.	Mesh Size	Depth (m) (fthms)	# of Fish in sample	Average Length (cm) (inches)	Average Weight (kgs) (lbs)	Block (Set)
1	6.5"	743 (406)	111	57.4 (22.6)	1.64 (3.62)	F1(1)
2	7.5"	743 (406)	76	64.8 (25.5)	2.55 (5.63)	F1(2)
3	6.5"	822 (450)	116	56.1 (22.1)	1.55 (3.41)	G2(1)
4	6.5"	1,098 (600)	110	57.9 (22.8)	1.74 (3.83)	F3(1)
5	8.0"	895 (489)	80	68.6 (27.0)	3.12 (6.88)	E2(1)

Table 3 Continued.

Sample No.	Mesh Size	Depth (m) (fthms)	# of Fish in sample	Average Length (cm) (inches)	Average Weight (kgs) (lbs)	Block (Set)
6	7.5"	943 (515)	84	66.8 (26.3)	2.83 (6.23)	E2(2)
7	8.0"	1,226 (670)	96	72.6 (28.6)	3.77 (8.32)	D3(1)
8	6.5"	1,162 (635)	83	63.0 (24.8)	2.30 (5.07)	D3(2)
9	6.5"	920 (503)	101	60.2 (23.7)	1.95 (4.30)	D1(1)
10	8.0"	928 (507)	93	74.4 (29.3)	3.95 (8.71)	D1(3)
11	8.0"	1,310 (716)	91	73.9 (29.1)	3.95 (8.71)	E4(3)
12	6.0"	1,290 (705)	95	61.2 (24.1)	2.06 (4.54)	E4(2)
13	6.5"	879 (480)	126	61.5 (24.2)	2.18 (4.80)	E2(3)
14	7.5"	1,114 (609)	105	68.3 (26.9)	2.97 (6.55)	C2(2)
15	6.5"	1,107 (605)	61	64.3 (25.3)	2.42 (5.34)	C2(1)
16	7.5"	889 (486)	108	69.3 (27.3)	3.12 (6.88)	B1(1)
17	6.0"	1,020 (558)	116	56.4 (22.2)	1.55 (3.41)	A2(2)

Note: While accurate length measurements were recorded, direct weighing of samples on board the "Ashley and Brothers" was not possible. Therefore the weights in Table Three are based upon a length-weight regression analysis by W.R. Bowering and D.E. Stansbury. ("Regressions of Weight on Length for Greenland Halibut, Reinhardtius hippoglossoides, from Canadian Waters of the Northwest Atlantic," Journal of Northwest Atlantic Fish. Sci., Vol. 5: 107-108.)

Based upon the results displayed in this table, the average length of turbot caught in 7.5" and 8.0" mesh nets was 9.7 cm (3.83") greater than turbot caught in 6.0" and 6.5" mesh nets. Similarly, the weight of

turbot caught in the larger mesh nets was 1.33 kgs (2.93 lbs) higher.

Regardless of water depth and net soak time, the larger mesh gear produced a higher yield of turbot per net. In fact, the catch results indicate that varying water depths had no significant effect on turbot catch rates during this survey.

CONCLUSIONS

This exploratory survey was successful in locating and fishing stocks of large turbot in deep waters. Significant catches were experienced in each block surveyed. Therefore, the entire 2100 square nautical mile area should be considered to have commercial potential for inshore gillnet vessels in the 16 to 20 metre (55' to 65') range.

This survey has demonstrated that these vessels can successfully fish for turbot in water depths of up to 1300 metres using gillnets.

Regardless of water depth, from 700 to 1300 metres (383 to 710 fathoms), the use of larger gillnet mesh sizes increases the overall yield of turbot per net by increasing the size of the fish captured. Large mesh nets also tend to reduce the occurance of undesirable species such as crabs and skate which would indicate that the use of larger mesh gear will reduce the time and labour required to clear a net, thus increasing the number of nets that could be hauled per trip. Furthermore, the chance of net damage caused by the removal of undesirable fish is reduced.

The use of larger gillnet mesh sizes enhances capture selectivity and promotes the growth of turbot stocks by allowing smaller turbot to escape capture.

Although catches realized during the survey may be considered to be marginal, it must be kept in mind that the vessels involved were operating in a survey situation and not a commercial fishing mode. Consequently, when good catches were taken in an area, the vessels were

required to move on to new grounds in order to complete the survey. This restricted their capability to take advantage of the productive areas. Catch results could also be improved if both vessels had used a full complement of 7.5" or 8.0" mesh nets which, as the results indicate, were more productive.

RECOMMENDATIONS

1. The Fisheries Development Division should continue commercial survey operations for turbot in deepwater, particulary on grounds extending north of the present survey.
2. Investigations should be made into developing/acquiring technology such as deepwater flotation systems, swivels, etc., that could potentially improve the performance of the nets.
3. Undertake the development of secondary products, such as smoked and marinated turbot, that can be derived from the large fish.
4. Pursue the development of products and markets for roughhead and roundnose grenadier.
5. If future deepwater turbot surveys are conducted, some 5.5" mesh nets should be used to determine catch rates for fish, such as the two species of grenadier, that are too small to be taken in larger (7.5" and 8.0") mesh.

ACKNOWLEDGEMENTS

The Fisheries Development Division, Fisheries Habitat Management Branch, would like to express sincere appreciation to Mr. Morley Rowe and the crew of the FV "Shanaleen" and to Mr. Melvin Leyte and the crew of the FV "Ashley and Brothers" for their support and assistance throughout the duration of this survey.

Sincere thanks are also extended to Michael O'Dea and John Kelland who gathered the data onboard the vessels and made significant contributions to this report.

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Appendix 1. Daily Activity Schedules of the FV Ashley and Brothers and the FV Shanaleen

DAILY ACTIVITY OF THE FV "ASHLEY AND BROTHERS"

Charter Day	Date	Activity
1	July 29	Mobilization
2	July 30	Steaming to Survey Area
3	July 31	Set one fleet in H4 Hauled one fleet in H4 Set two fleets in F1 Set two fleets in G2
4	Aug. 1	Set two fleets in F3 Hauled two fleets in F1 Set two fleets in E2 Set two fleets in F1
5	Aug. 2	Hauled two fleets in G2 Hauled one fleet in F3 Set one fleet in E4 Set two fleets in D3
6	Aug. 3	Hauled one fleet in F3 Hauled two fleets in E2 Set one fleet in D1
7	Aug. 4	Set two fleets in D1 Hauled two fleets in F1 Hauled one fleet in E4 Set one fleet in E4 Set two fleets in E2
8	Aug. 5	Set one fleet in E4 Hauled two fleets in D3 Hauled one fleet in D1
9	Aug. 6	Set two fleets in C2 Hauled two fleets in D1 Set two fleets in B1
10	Aug. 7	Hauled two fleets in E4 Hauled two fleets in E2
11	Aug. 8	Set two fleets in B1 Set two fleets in A2 Hauled two fleets in C2
12	Aug. 9	Hauled two fleets in B1 Hauled one fleet in A2

Ashley and Brothers activity continued:

Charter Day	Date	Activity
13	Aug. 10	Hauled one fleet in A2 Hauled one fleet in B1 Headed for port
14	Aug. 11	Arrived port, Valleyfield

DAILY ACTIVITY OF THE FV "SHANALEEN"

Charter Day	Date	Activity
1	July 27	Mobilization
	Note:	Six fleets were set in Block E1 prior to the start of the survey.
2	July 28	Steaming to Survey Area
3	July 29	Hauled one fleet in E1
4	July 30	Hauled two fleets in E1
5	July 31	Set one fleet in H4 Hauled one fleet in E1 Hauled one fleet in H4
6	Aug. 1	Set two fleets in G3 Set one fleet in G4 Set two fleets in F4 Hauled one fleet in E1 Set two fleets in F2
7	Aug. 2	Hauled one fleet in E1 Set two fleets in D2
8	Aug. 4	Hauled two fleets in G3 Hauled one fleet in G4 Hauled one in fleet F4 Set two fleets in E3
9	Aug. 5	Hauled one fleet in F4 Hauled two fleets in F2
10	Aug. 6	Set two fleets in C1 Set two fleets in B2 Hauled one fleet in D2

Shanaleen activity continued:

Charter Day	Date	Activity
11	Aug. 7	Hauled two fleets in E3 Hauled one fleet in D2 Set two fleets in A1
12	Aug. 8	Hauled two fleets in B2 Hauled one fleet in C1
13	Aug. 9	Hauled one fleet in C1 Hauled one fleet in A1 Set one fleet in A1
14	Aug. 10	Hauled two fleets in A1 Set four fleets in A1 Set two fleets in B1 Head for Port
15	Aug. 11	Arrive Port, Seldom

Appendix 2. Fleet Statistics - July 27 to August 11, 1990

Fleet Statistics - July 27 to August 11, 1990

Block No.	Avg. Pstn. of Nets	# of Nets Set	Avg. Depth (m)	Avg. Soak Time (hrs)	Avg. Haul Time (hrs)	Catch (kgs) Turbot	RHG	Black Dogfish	Other
A1	50 53'N 50 29'W	73	881	35	3.5	2,600	422	9	0
A2	50 52'N 50 17'W	48	1,037	38	3.0	1,233	294	172	43
B1	50 47'N 50 23'W	80	908	59	3.75	3,064	802	314	70
B2	50 43'N 50 12'W	48	1,125	40	4.0	1,766	317	68	5
C1	50 34'N 50 22'W	47	1,025	57	4.0	1,564	240	27	13
C2	50 32'N 50 15'W	50	1,109	62	4.0	1,558	386	92	172
D1	50 21'N 50 20'W	74	940	40	3.5	3,470	646	252	118
D2	50 27'N 50 13'W	50	1,096	107	4.0	2,406	181	290	2
D3	50 21'N 49 57'W	50	1,189	43	3.5	2,347	419	52	174
E1	50 15'N 50 23'W	125	742	25	4.0	15,700	3,081	1,000	300
E2	50 12'N 49 58'W	108	924	54	4.0	5,002	997	392	143
E3	50 14'N 49 43'W	38	1,116	57	3.0	796	362	180	8
E4	50 11'N 49 43'W	72	1,296	41	2.5	2,204	435	35	872
F1	50 09'N 50 17'W	111	755	41	3.5	3,724	1,311	9	89
F2	50 08'N 50 06'W	49	833	94	4.5	3,326	435	113	8
F3	50 04'N 49 47'W	50	1,119	47	4.0	1,724	330	135	70

Fleet Statistics Continued.

Block No.	Avg. Pstn. of Nets	# of Nets Set	Avg. Depth (m)	Avg. Soak Time (hrs)	Avg. Haul Time (hrs)	Catch (kgs) Turbot	RHG	Black Dogfish	Other
F4	50 04'N 49 43'W	50	1,214	79	3.5	2,615	363	70	10
G2	49 56'N 50 00'W	48	805	43	3.0	1,948	393	24	30
G3	49 55'N 49 48'W	45	1,011	78	3.75	1,853	363	66	3
G4	49 56'N 49 42'W	24	1,180	78	5.0	1,057	318	8	8
H4	49 43'N 52 00'W	50	1,012	13.5	4.0	749	67	55	18

Total Nets: 1,290

Average Depth: 1,070 Metres (585 Fathoms)

Average Soak Time: 54 Hours

Average Haul Time per Fleet (24 - 28 Nets): 3.75 Hours

Total Turbot Catch: 60,706 Kgs (133,555 lbs)

Total Roughhead Grenadier Catch (RHG): 12,162 Kgs (26,756 lbs)

Total Black Dogfish Catch: 3,363 Kgs (7,398 lbs)

Total Other Catch: 2,156 Kgs (4,743 lbs)

Appendix 3. Graphical Analysis of Survey Results

Graph One: Mesh Size / Yield Comparison

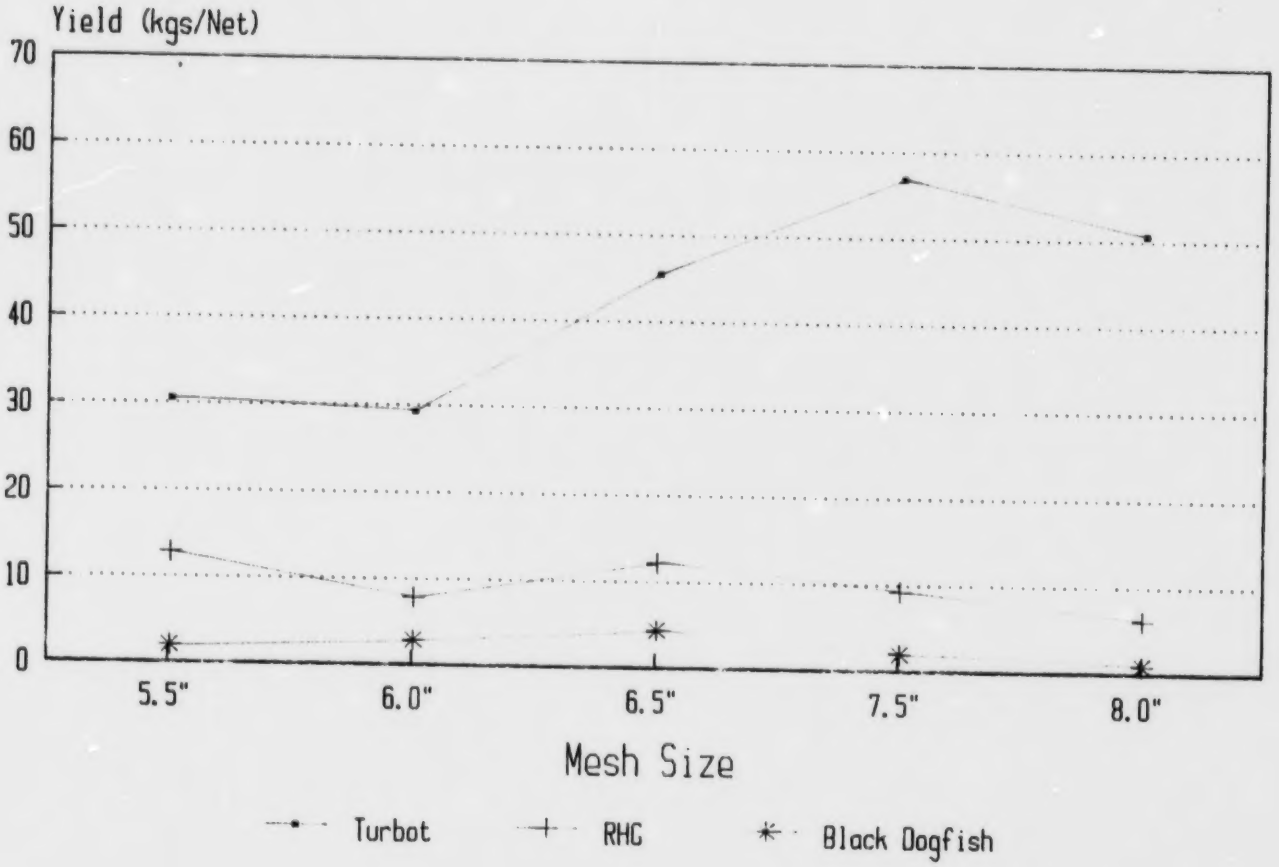
Graph Two: Mesh Size / Avg. Turbot Length

Graph Three: Mesh Size / Avg. Turbot Weight

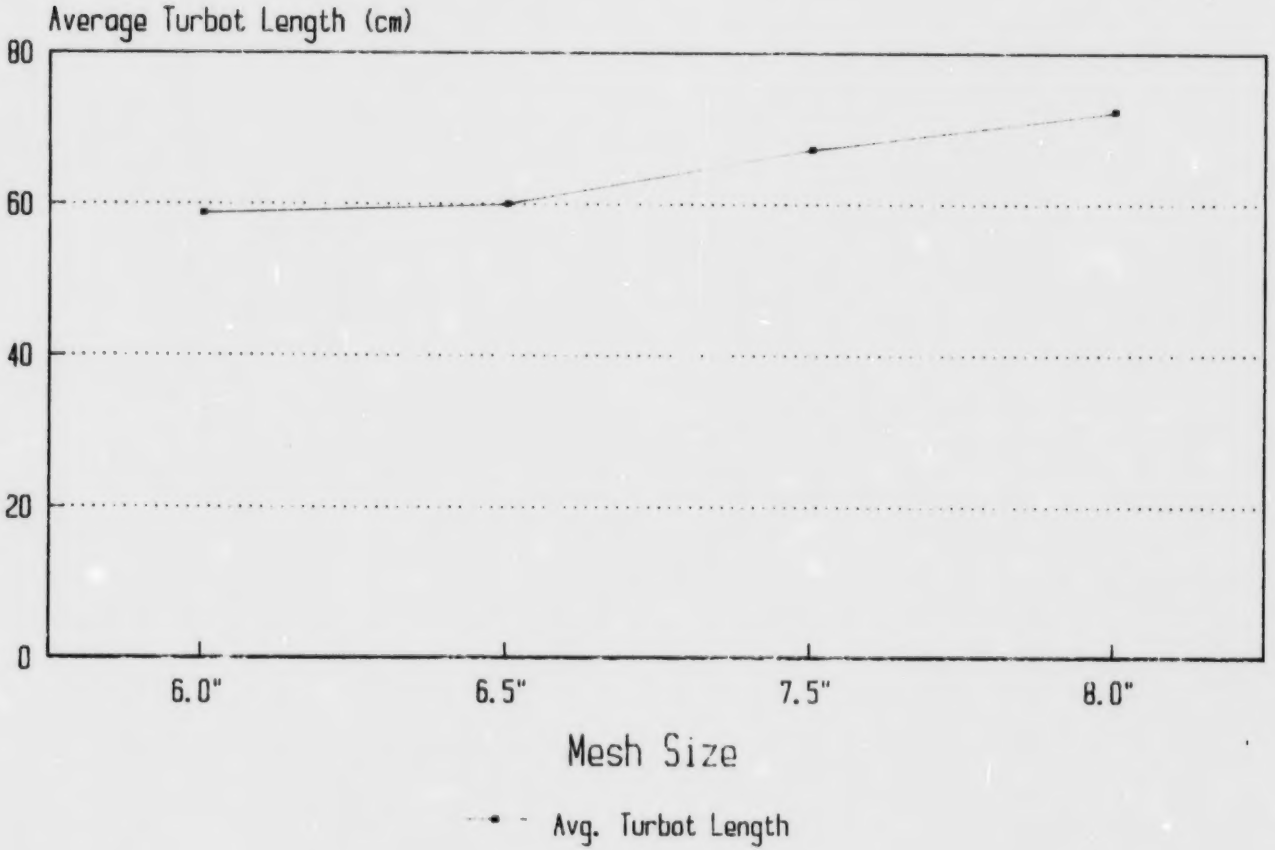
Graph Four: Net Depth / Yield Comparison

Graph Five: Net Soak Time / Yield Comparison

Graph One
Mesh Size/Yield Comparison

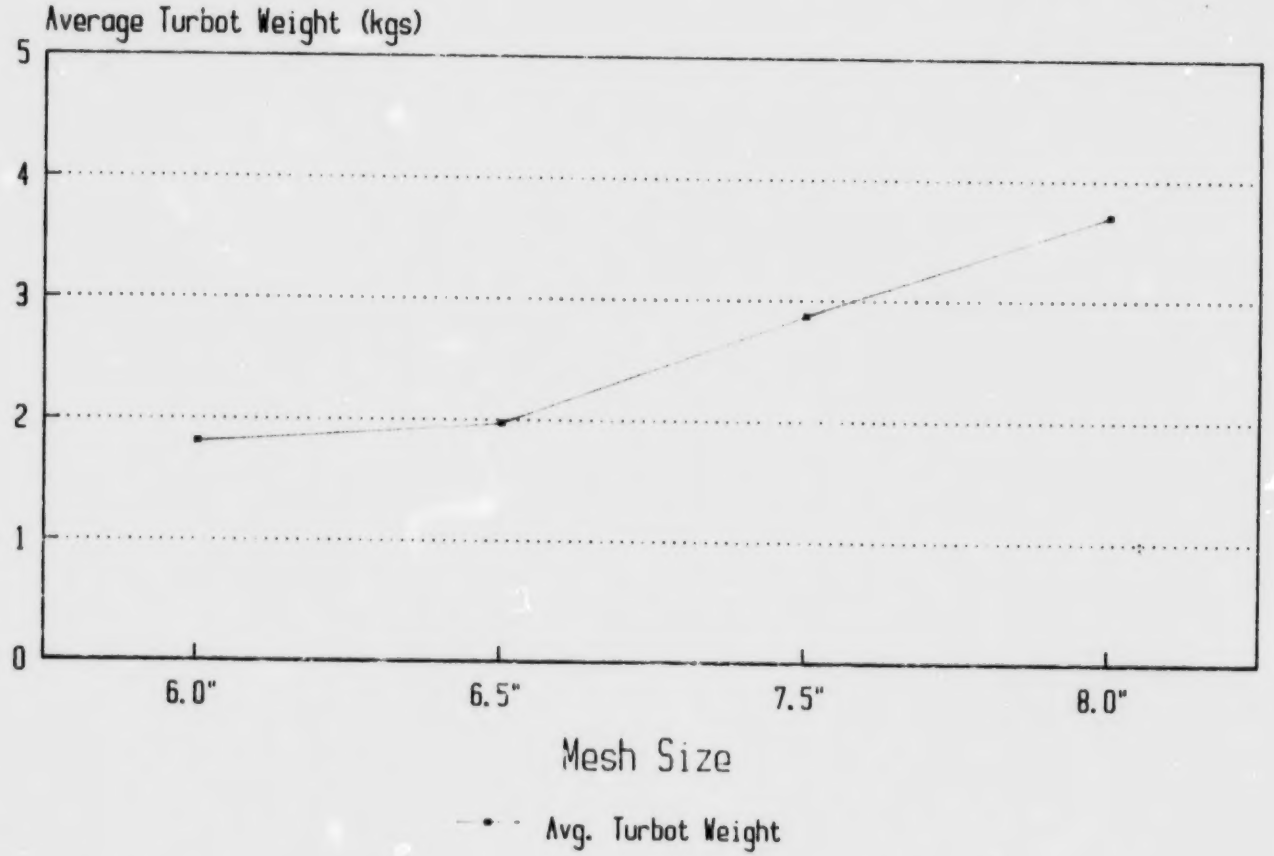


Graph Two
Mesh Size/Length Comparison



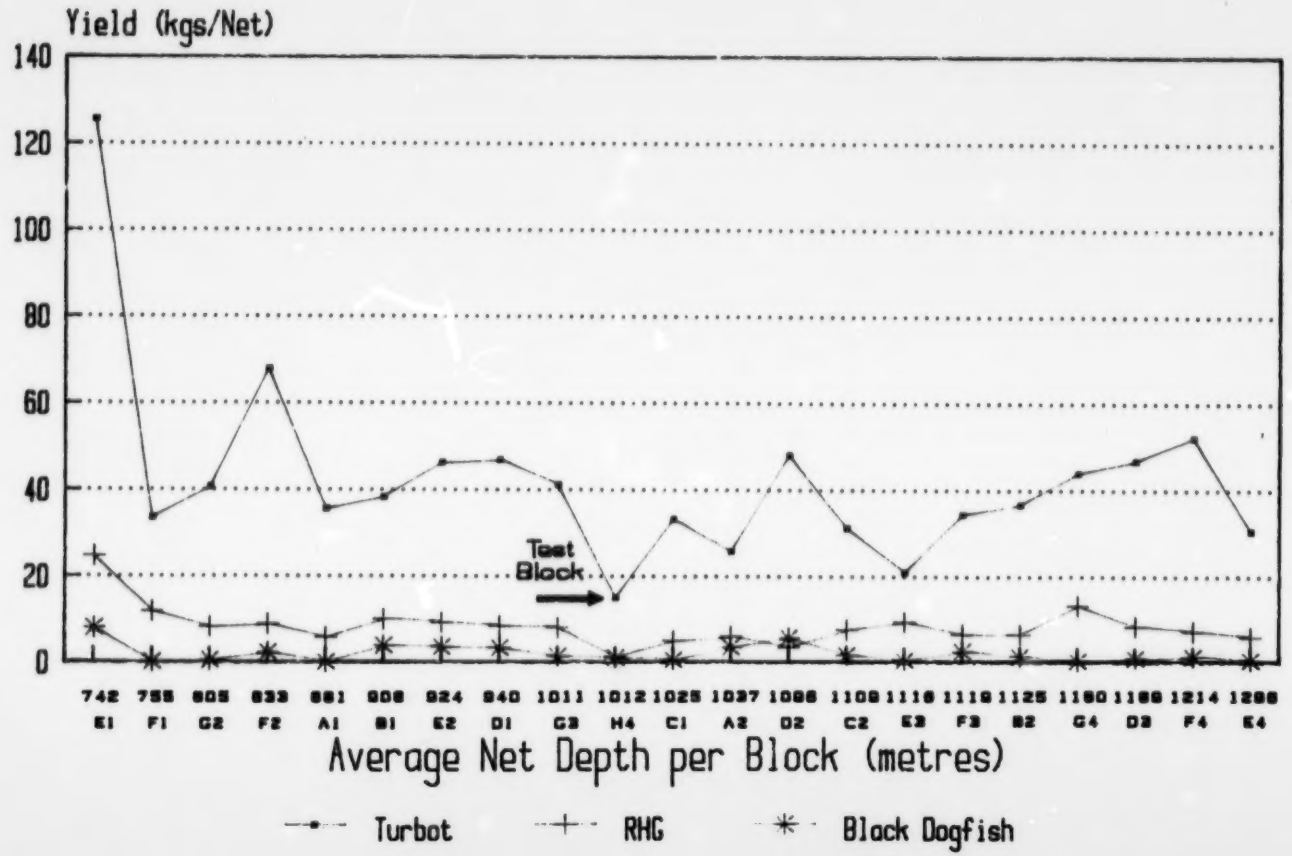
Graph Three

Mesh Size/Avg. Turbot Weight Comparison



Graph Four

Net Depth/Yield Comparison



Graph Five

Net Soak Time/Yield Comparison